

Los Alamos National Laboratory  
Environmental Restoration Program  
Standard Operating Procedure

No: LANL-ER-SOP-07.01 Rev: 0

Pressure Transducers

Preparer: Sandra E. Wagner Sandra E. Wagner 10-16-91  
(Print Name) (Signature) (Date)

Quality Review by: Bruce Gallaher Bruce Gallaher 9/30/91  
(Print Name) (Signature) (Date)

Technical Review by: Bruce Gallaher Bruce Gallaher 9/30/91  
(Print Name) (Signature) (Date)

QPPL Approval: Larry Maassen Larry Maassen 10-10-91  
(Print Name) (Signature) (Date)

PM Approval: Robert W Voelke Robert W Voelke 10/14/91  
(Print Name) (Signature) (Date)

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## PRESSURE TRANSDUCERS

### 1.0 PURPOSE

The purpose of this procedure is to describe the methods for conducting office and field checks of pressure transducers for use in the Environmental Restoration (ER) program.

### 2.0 SCOPE

#### 2.1 Applicability

This procedure is applicable to all personnel who are operating pressure transducers for the ER Program.

#### 2.2 Training

The field team leader should ensure that field team members understand the use of pressure transducers and the specific data loggers with which they are to be used. The field team members must document that they have read and understand this procedure, as well as the procedures in Section 1.0, General Instructions.

### 3.0 DEFINITIONS

A. Hydrostatic pressure: The pressure exerted by a column of fluid.

### 4.0 BACKGROUND AND/OR CAUTIONS

A pressure transducer measures pressures over a specific range of submergence. Outside this range, measurements will not be accurate. If the transducer is over-pressured, permanent damage can occur; therefore, the transducer probe must never be submerged beyond its rated depth. Pressure transducers are designed to be used with automatic data logging instruments and send a current to the data logger. The current is proportional to the pressure and can be converted to meaningful units by the data logger. The pressure measured is the total pressure, which includes the hydrostatic pressure of the fluid column above the transducer and the atmospheric pressure at the fluid surface.

Most pressure transducers are self-compensating for changes in atmospheric pressure via a vent to the atmosphere. The vent port is normally located where the cable attaches to the data logger, thus, where extension cables are being used, the operator should ensure that the connector is not submerged. Also, there should be no sharp bends in the transducer cable.

There are a number of pressure transducers on the market and the operator must consult the manufacturer's specifications concerning maintenance and chemical compatibility with contaminants which are expected to be present in the medium to be monitored (usually water).

Under normal conditions it should not be necessary to disassemble the pressure transducer. However, if it does become necessary, follow the manufacturer's instructions carefully and check the accuracy of the reassembled probe as discussed in Section 6.0.

NOTE: Many data loggers contain lithium batteries, which are classified by the Department of Transportation (DOT) as hazardous material. Contact the DOT and all other authorities (i.e., Federal Express, Airport, etc.) involved with equipment shipment for instructions.

Site workers preparing for field operations should read and understand the procedures outlined in LANL-ER-SOPs, Section 2.0, Health and Safety in the Field. In addition, site workers should refer to site-specific Operable Unit Health and Safety plans for the particular health and safety equipment to be used.

## 5.0 EQUIPMENT

Equipment to implement this procedure are listed in Attachment A.

## 6.0 PROCEDURE

Be sure to record the information on the manufacturer's data log sheet. Begin by identifying the serial number and model number of the instrument. Use the Daily Activity Log (refer to SOP-01.04).

- A. Assemble the equipment and supplies listed in Attachment A. Consult manufacturers instructions to ensure the proper operation of all equipment.
- B. Ensure the proper operation of the electronic data logger and pressure transducer. Review guidelines in the operator's manual for the electronic data logger. Consult the manufacturer's instructions as to the setting of transducer depth, the reference elevation, scale factor, and test number. Be sure that the data logger or its battery pack is fully charged. Using a 3- to 4-ft column of water (for example, capped PVC casing), test the response of the electronic data logger and pressure transducer.
- C. Conduct a test for the proper depth response and a test for the drift of readings in this column, as discussed below. These tests constitute a calibration check for the data logging instrumentation. Perform this check daily where possible.

### Depth Response Test

1. Mark the length of the transducer cable at measured intervals appropriate for the column of water. Using a 4-ft column of water, for example, mark the cable with tape at 1-ft intervals (for a 3-ft length), measuring from the transducer end.

2. Connect the cable to the data logger and put the data logger into display mode so that changes in hydrostatic pressure can be monitored.
3. Fill a capped PVC well screen with water and lower the transducer probe into the filled casing to the first mark and obtain a reading. Repeat until the last mark has been reached. Start the logging sequence.
4. Wait one minute and raise the transducer a measured length. Wait one more minute.
5. Continue raising the transducer cable by the measured increments and logging the results for one minute until all segments have been measured.
6. Check the depth recorded on the data logger against the actual depths. If the difference is greater than 5% of the measured depth, return the transducer to the manufacturer for calibration.

#### Drift Test

1. Lower the transducer into the water column and tape to the edge of the column.
  2. Connect the transducer cable to the electronic data logger and begin a 15-min logging sequence.
  3. Check the results for noticeable drift of the depth measurement.
  4. Notify the manufacturer if an unacceptable noticeable drift is occurring.
- D. Locate the monitoring wells where the pressure transducer will be calibrated.
- E. Decontaminate the transducer and cable as specified in SOP-02.07, General Equipment Decontamination.
- F. Take an initial water level measurement from the well to be monitored using a tape or water level sounder according to SOP-07.02, Fluid Level Measurement. Record all pertinent information on the Groundwater Elevation form found in SOP-07.02.
- G. Before beginning the monitoring, set up the data logger as outlined in the manufacturer's manual. The type of information may vary, depending on the model used. When using different models, consult the operator's manual for the proper data entry sequence to be used. Be sure that the field operator understands what computations must be made and how to save the data to prevent accidental data loss.
- H. Cover sharp edges of the well casing with duct tape to protect the transducer cables. Lower the pressure transducer into place, monitoring the hydrostatic pressure during installation. Duct tape transducer into place prior to commencement of test.

- I. Check the depth of the transducer using the display mode of the data logger and test transducer response by raising it about a foot.
- J. Commence the water level measuring task to be performed (for example, slug test or pumping test).
- K. Ensure that all equipment is accounted for and decontaminated (SOP-02.07). If decontamination is required, dispose of all decon materials according to SOP-01.06, Management of RFI-Generated Waste.
- L. Print out data prior to the shutdown of the electronic data logger (see operator's manual).

## 7.0 REFERENCES

The following procedures are directly associated with this procedure and should be reviewed before field operations:

LANL-ER-SOPs in Section 1.0, General Instructions.  
LANL-ER-SOPs in Section 2.0, Health and Safety in the Field.  
LANL-ER-SOP-07.02, Fluid Level Measurement.  
LANL-ER-SOP-07.03, Well Slug Tests.  
LANL-ER-SOP-07.04, Aquifer Pumping Tests.

Enviro-Labs, Inc. 1986. "Operation manual: EI-200 Groundwater Monitoring System with Model EL-120-MCP Data Logger," April 1986. Milford, NH.

In-Situ, Inc. 1984. "Owner's Manual: Hydrologic Analysis System, Model SE200," April 1984. Laramie, WY.

## 8.0 RECORDS

- A. Completed Groundwater Elevation form.
- B. Completed Daily Activity Log which will include calibration data, any calculations, decontamination procedures, any deviations, data from the electronic data logger, and additional comments.

## 9.0 ATTACHMENTS

- A. Equipment and supplies checklist

**EQUIPMENT AND SUPPLIES CHECKLIST  
FOR PRESSURE TRANSDUCERS**

- \_\_\_\_\_ Electronic data logger and printer or level head
- \_\_\_\_\_ Pressure transducer and cable
- \_\_\_\_\_ Water level sounder
- \_\_\_\_\_ Tape measure graduated in 0.01 ft
- \_\_\_\_\_ Capped PVC casing
- \_\_\_\_\_ Duct tape
- \_\_\_\_\_ Clean water
- \_\_\_\_\_ Decontamination equipment
- \_\_\_\_\_ Specifications (copies) for pressure transducer  
being used and manual for data logger
- \_\_\_\_\_ H&S protective clothing
- \_\_\_\_\_ Waterproof pen
- \_\_\_\_\_ Groundwater Elevation forms
- \_\_\_\_\_ Daily Activity Logs